102. Proposed by F. L. SAWYER. Mitchell, Ontario, Canada.

Prove that the factors of the sum of the squares of two numbers prime to each other are themselves the sum of two squares.

Solution by DR. L. E. DICKSON, The University of Chicago.

If a and b are relatively prime, every prime divisor of a^2+b^2 is of the form $4n+1$; inversely, every prime of the form $4n+1$ can be expressed as the sum of the squares of the two relatively prime integers. These are well known theorems in the Theory of Numbers (compare Weber's *Algebra*, 1st edition, I, p. 585). Let a^2+b^2 have the prime factors $p_1, p_2, \ldots, p_s$, which need not be distinct. In view of the theorems quoted, $p_i=x_i^2+y_i^2$, where x_i and y_i are integers. But

$$(x_i^2+y_i^2)(x_j^2+y_j^2)=(x_ix_j+y_iy_j)^2+(x_iy_j-x_jy_i)^2.$$

It fellows that any prime or composite divisor of a^2+b^2 is the sum of two squares.

Also solved by *LON C. WALKER*, and *G. B. M. ZERR*.

PROBLEMS FOR SOLUTION.

ARITHMETIC.

165. Proposed by B. F. FINKEL, A.M., M.Sc., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

A borrows $2000 and agrees to pay back principal and interest in 100 equal monthly payments. Find the monthly payment. What would he have to pay yearly on the same conditions in order to discharge the debt in 100 months?

ALGEBRA.

173. Proposed by JOHN M. COLAW, A. M., Monterey, Va.

Solve $\sqrt{(a+x+y)}=z....(1)$, $\sqrt{(b+y+z)}=x....(2)$, $\sqrt{(c+z+x)}=y....(3)$.

GEOMETRY.

195. Proposed by F. L. SAWYER, Mitchell, Ontario, Canada.

The diagonals of a four-sided figure are h and k, and the area is A; show that the area of the circumscribing square is

$$\frac{h^2k^2-4A^2}{h^2+k^2-A}.$$

196. Proposed by HARRY S. VANDIVER, Bala, Pa.

If a quadrilateral circumscribe a circle, the two diagonals and the two lines joining the points where the opposite sides of the quadrilateral touch the circle will all four meet in a point.